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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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| Applicant:  | Chris E. Barns et al. | § |                             |
|   |                       | § | Art Unit: 2822              |
|   |                       | § |                             |
| Serial No.:   | 10/629,127            | § | Examiner: Khanh B. Duong    |
|   |                       | § |                             |
| Filed:  | July 29, 2003         | § | Atty Docket: ITL.1016US     |
|   |                       | § | P16703                      |
|   |                       | § |                             |
| For: Preventing Silicide Formation at the<br>Gate Electrode in a Replacement<br>Metal Gate Technology |                       | § | Assignee: Intel Corporation |
|   |                       | § |                             |

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**REPLY BRIEF**

In response to the new arguments raised by the Examiner, this reply brief is submitted.

**A. Are Claims 1-3 and 5-12 Anticipated by Lee?**

The Examiner concedes on page 3, lines 6 and 7, of the office action that "... the CMP process only etches/removes layers 76, 72, and 52 residing above the polysilicon 30."

Claim 1 calls for moving the hard mask using an etch that is selective of a hard mask over the spacer. In the cited reference, element 52 is the hard mask. The Examiner admits that the sidewall spacer is 72. See the Answer, page 3, lines 1-8. Given the fact that the Examiner admits that the hard mask etch also etches the spacer, it is incomprehensible how he continues to maintain the rejection. Plainly, by the Examiner's own reasoning in the Answer, there is no question but that the etch is not selective of the hard mask over the spacer since the Examiner

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expressly admits that the hard mask etch etches the spacer 72. See definition of selective etch from the Internet glossary, attached.

On the same basis, the Examiner's alternative theory must fail. There, he posits a stripping process which is never shown in the reference. However, he suggests that "... the stripping process only removes the hard mask layer 52 in portions of 152 above the polysilicon 30 spacer." Then he goes on to state that "the sidewall spacer of nitride 72 is not etched/removed." Of course, this is impossible, as shown in the evidence appendix in the original brief. The top of the blanket deposited sidewall spacer is etched away and, therefore, the etch could not be selective of the mask over the spacer because, in order to get down to the mask, it had to etch through the spacer material. This the Examiner conceded effectively in his argument at the top of page 3 of the appeal brief.

In other words, whatever etch is utilized to etch the hard mask must etch through the top portion of the same material that will become the sidewall spacer. Thus, in order to get down to the hard mask, it must etch through the sidewall spacer material. Therefore, the etch cannot be selective of the hard mask over the sidewall spacer material because if it were, the hard mask would never be etched because the material would not be able to etch through the spacer material that is over the hard mask.

The Examiner argues that the spacer is the sidewalls of the vertical portion, not the entire blanket deposited material. Of course, this is so, but it misses the critical point. In order to form the vertical portions, a blanket deposited layer had to have been formed. Thus, it included a top horizontal portion which the Examiner's so-called selective etches had to have removed. Just because this step is not shown in the patent, one skilled in the art would know that the way sidewall spacers are formed is to blanket deposit a material and then remove the vertical or upper portion of that material to form the sidewalls. There is no other known way to simply form vertically extending portions alongside a gate or other structure. The etch must remove the upper portions and, therefore, cannot be selective of the mask over the spacer.

Since whatever strip or etch or CMP is utilized must go through the same material that forms the sidewall spacers to get down to the hard mask, there is simply no way to reasonably suggest that the etch is selective of the hard mask over the sidewall spacer material. We do not have to guess. We know it cannot be so because there is no way to get down to the hard mask without going through the same material that forms the sidewall spacers. There is no question

that the layer 72 is blanket deposited because this is expressly explained at column 4, lines 9 and 10.

Therefore, the rejection should be reversed.

**B. Are Claims 14, 16-19, and 25-27 Unpatentable Over Lee '648 in View of Lee '530?**

The Examiner makes the observation that a selective etch is something that only removes a part of the material. By this incredible definition, the Examiner reads "selective" from the term "etch." Every etch leaves something. If the etch totally removed everything, there would be no point to put down the material to be etched in the first place. Thus, inherently, all the etches remove only a portion of the material. A selective etch is one that preferentially removes one type of material relative to another type of material. Necessarily, a selective etch selects one material relative to another. See the attached definition of selective etch from the Internet.

The assertion that the claim does not preclude the hard mask from being over other structures is unsupportable. Claim 14 says that the first polysilicon gate structure is replaced with a metal gate replacement. Thus, the first polysilicon gate structure is fixed and defined in the claim. It must be the same first polysilicon gate structure that is the object of the phrase selectively preventing the formation of a silicide on the first polysilicon gate structure, it must be the one that gets the hard mask "over said first polysilicon gate structure," and the removing the hard mask step since it refers to "the hard mask" must be removing the hard mask over the first polysilicon gate structure. Logic permits no other reading of the claim. The suggestion that the applicant is trying to read the claim based on the specification is baseless and logically untenable.

The suggestion that Lee suggests something in Figure 8 is certainly hard to understand. There is no discussion of any device performance so these are merely figments of the Examiner's hindsight induced imagination. Nowhere does the Examiner attempt to find of doing the first three steps in order to enable replacement with a metal gate replacement. There is no teaching of preventing the formation of a silicide on a first polysilicon gate structure, enabling it to be removed, since removing such a structure with silicide is more difficult. Lee '530 cannot supply any of these missing elements because he does not teach selecting two gates, one of which is primed for replacement and the other which is not.

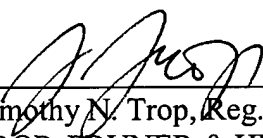
Recognizing that a rationale is needed is not the same as providing the missing rationale. It is respectfully submitted that even the augmentation suggested in the Examiner's Answer fails to meet the requirements for a rationale to combine the two patents. Moreover, even if the references were combined, they still would not meet the claimed invention.

Therefore, the rejection should be reversed.

Respectfully submitted,

Date:

5/8/06

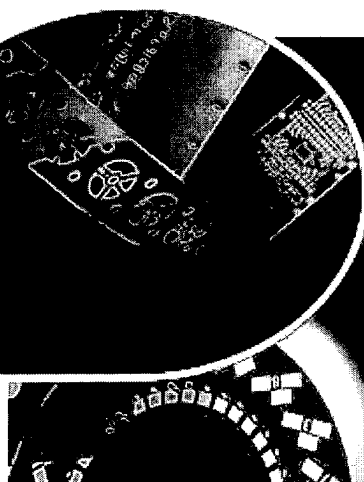
  
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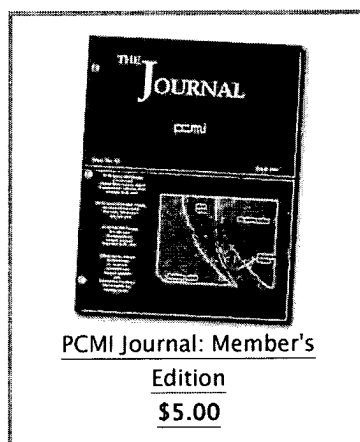


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## PCM Glossary: Terms & Definitions

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### A

**A A(S):** Atomic Absorption (Spectrometry) is used for analysing solutions for their metal content.

**Acid:** A substance which, when dissolved in water, forms a solution, with a pH of less than 7. The etchant used to dissolve the substrate, to form the component/features.

**Actinic:** Optical energy that is absorbed by radiation-sensitive coatings to produce an image by chemical changes.

**Alignment:** The accuracy of the relative position of an image on a phototool with respect to: (a) an existing image on a substrate, or (b) each of the two pieces of film making the phototool.

**Alignment Mark:** An image selectively placed within or out of an array for either testing or aligning or both.

**Alkali:** A substance which, when dissolved in water, forms a solution with a pH more than 7.

**Ammoniacal:** An ammonia-based etchant commonly used for copper.

**Angstrom:** Unit to define wavelength of light, ultraviolet energy and x-rays; one angstrom is equivalent to  $10^{-1}$  nanometres ( $10^{-10}$  metres).

angle with respect to the X and Y axes during step-and-repeat.

**Runout:** The sum of cumulative-pitch error when measured across a number of functional geometric patterns on a photomask.

**S**

**Safelight:** A darkroom or processing area lamp which emits light of a colour that will not affect the photographic material within a reasonable handling time.

**Sandwich:** Phototool for double-sided PCM, comprising two pieces of mirror-imaged film

**Scratch:** A cut on the surface of an object deep enough to catch a fingernail.

**Screening Cans:** Are used on PCBs to reduce or remove RFI and EMI.

**Scribecoat:** A material composed of a stable base such as glass or film with an opaque coating.

**Scribing:** To produce artwork by scraping the opaque coating from the scribecoat material with a blade-like cutting tool with the blade edge parallel to and resting on the plane of the base material.

**Scuff:** Marks on the surface of flat-rolled metal caused by surface-to-surface rubbing.

**Selective Etch:** Etching at unequal rates in limited areas, frequently caused by inhomogeneities in the workpiece material, hot spots from unequal heat transfer or, on a microscale, selected grain faces or constituents.

**SEM:** Scanning Electron Microscope.

**Serif:** A drafting compensation in artwork to minimize the rounding of inside or outside corners.